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The
Florida Entomologist

Official Organ of the Florida Entomological Society

Vol. XV NOVEMBER, 1931 No. 3

A CORRELATION OF THE DATE OF EMERGENCE AND PERCENTAGE OF SURVIVAL OF THE COTTON BOLL WEEVIL WITH THE DATE OF THEIR INSTALLATION IN HIBERNATION CAGES

P. W. CALHOUN

It has long been known that placing cotton boll weevils (*Anthonomus grandis* Boh.) in hibernation cages early in the fall greatly reduces the percentage of weevils which survives the winter. The effect which early confinement in cages has on the time of emergence from hibernation, however, has not been extensively studied. Concerning one series of hibernation cages Newell (5) states that, in general, the earlier the weevils were confined in cages, the earlier in spring were the majority of them out of hibernation and active. It is reported elsewhere (4) that placing the weevils in hibernation cages late in the fall decreased the duration of the time spent in hibernation. No claim was made, however, that the date of their emergence was affected thereby.

To determine the effect that the date of confining weevils in hibernation cages in the fall might have on the date of their emergence or the percentage of their survival, the data from eleven groups of hibernation-cage experiments conducted in Florida and one conducted at Mansura, Louisiana, were examined.* The groups studied represent three general types of hibernation-cage experiments, namely: Cages placed on the ground, in open fields, in which dried grass, leaves and corn

*All Florida hibernation cage experiments used in the following tables were conducted under the direction of Geo. D. Smith. The Gainesville series was set up and cared for by C. A. Bennett. The results of only one of the Florida series, that conducted at Madison, Fla., in 1918-19, has been published (6). The Mansura, La., experiment was conducted by Newell and Dougherty in 1908-09 (5).

stalks were the principal protective materials used; (2), cages placed on the ground, in woods, in which pine straw and Spanish moss were the principal protective materials; (3), cages placed in trees, in woods, in which Spanish moss was the principal protective material. In each group the weevils were installed at either weekly or bi-weekly intervals, and, although the groups differed considerably among themselves, the cages of each group were prepared as nearly alike as possible.

To ascertain whether the time of confining the weevils in the cages was a controlling factor in determining the time of their emergence from hibernation, the emergence data from nine of the groups were arranged so that the degree of linear correlation existing between these two variables could be calculated. Table I shows how the data of each group were arranged for calculating the coefficient of correlation between the date of confinement in the cages and the date of their emergence.

TABLE I.—ARRANGEMENT OF DATA FOR CALCULATING THE COEFFICIENT OF LINEAR CORRELATION BETWEEN THE DATE BOLL WEEVILS WERE CONFINED IN HIBERNATION CAGES AND THE DATE OF THEIR EMERGENCE FROM HIBERNATION. THE DATA SHOWN ARE THOSE OF THE TREE SERIES, OF 1923-24, MADISON, FLORIDA.

Cage No.	A Days after Sept. 25 cage was started	B Days after March 25 before 95% emergence occurred	Correlation coefficient, r, between A and B
1	7	3	
2	21	24	
3	38	28	+ .99
4	52	44	
5	68	62	

The correlation coefficients were calculated for fifty and ninety-five percent emergence. One hundred percent emergence was not included, as the last two or three weevils often emerge two or more weeks after the active emergence period. To have included them would have introduced more error than did their removal from the experiment.

The values of the correlation coefficients so found are shown in Table II.

TABLE II.—DEGREE OF LINEAR CORRELATION BETWEEN THE DATE OF PLACING BOLL WEEVILS IN HIBERNATION CAGES AND THE DATE ON WHICH FIFTY AND NINETY-FIVE PERCENT EMERGENCE HAD OCCURRED IN NINE GROUPS OF HIBERNATION CAGES.

Location of Cages	Dates cages were started	Correlation coefficient found for 50% and 95% emergence under different hibernating conditions					
		Cages on ground in open field		Cages on ground in woods		Cages in trees in woods	
		50%	95%	50%	95%	50%	95%
Gainesville, Florida	1923 Oct. 1 Oct. 15 Nov. 1 Nov. 15 Dec. 1	—.95	—.95	—.37	—.08	—.68	+.34
Madison, Florida	1923 Oct. 1 Oct. 15 Nov. 1 Nov. 15 Dec. 1	+.89	—.04	+.82	—.15	+.90	+.99
Madison, Florida	1924 Oct. 1 Oct. 7 Oct. 16 Oct. 23 Oct. 30 Nov. 6 Nov. 13 Nov. 20 Nov. 27	+.46	+.81	.....	.....	—.10	+.73
Mansura, Louisiana	1908 Sept. 28 Oct. 5 Oct. 12 Oct. 19 Oct. 26 Nov. 2 Nov. 9 Nov. 16 Nov. 23 Nov. 30 Dec. 7 Dec. 14 Dec. 21	+.70	+.10	.....	.....	.....	.....

In Table II the negative correlations are seen almost to counterbalance the positive correlations. Still more striking is that the sign of the correlation coefficient in several instances was, in the same group of cages, positive for fifty percent emergence and negative for ninety-five percent emergence, or vice versa. It seems quite apparent that, on the whole, the date of placing the weevils in the hibernation cages did not determine to any great extent the date of their emergence during the following spring.

It is common knowledge, however, that a greatly reduced emergence percentage almost invariably accompanies early, as contrasted with late, fall confinement in cages. This has been one of the chief experimental bases for recommending that cotton stalks be destroyed early in the fall. With this in mind the twelve groups of cages were examined for further evidence concerning the relationship that existed between the earliness of confinement and the percentage of survival.

Because of the great differences in the total percentages of emergence among the different groups of cages, it was difficult to compare, offhand, one group with another, although it was quite apparent that in each group the lower percentages of survival were found among the earlier installations. Indexes of variation were, therefore, calculated for each group of cages. The index assigned to each cage is the percent survival of that cage divided by the average percentage of survival of its group. If the relative variation in one group be the same as the relative variation in another group, the indexes of variation of the two groups will be identical, regardless of the fact that the actual percentage of survival in one case may be much higher than in the other. An index of unity shows that the percentage survival of a particular cage was equal to the average percentage survival of its group.

Table III shows the data used for this study. The groups are the same as those used in Table II, with the addition of three groups started at Madison, Fla., in the fall of 1918 (6). Sufficient data were not available to include these groups in Table II.

Inspection of the indexes of variation in Table III shows that, in the groups placed on the ground in open fields, the relative percentage of survival was very low for all cages started before Oct. 15. In none of the Florida cages placed in fields did

TABLE III.—PERCENT OF BOLL WEEVILS SURVIVING THE WINTER AND THE INDEX OF VARIATION OF EACH CAGE IN NINE GROUPS OF HIBERNATION CAGES UNDER DIFFERENT HIBERNATING CONDITIONS.

Location of cages	Dates cages were started	Percent weevils surviving and index of variation* for each cage					
		Cages on ground in open field		Cages on ground in woods		Cages in trees in woods	
		Percent surviving	Index of variation	Percent surviving	Index of variation	Percent surviving	Index of variation
Gainesville, Fla.	1923						
	Oct. 1	0.3	0.05	15.3	0.82	8.9	0.80
	Oct. 15	2.9	0.51	12.5	0.67	4.9	0.44
	Nov. 1	9.0	1.57	13.6	0.73	8.6	0.77
	Nov. 15	5.5	0.96	28.5	1.53	27.4	2.46
	Dec. 1	10.9	1.91	23.3	1.25	5.9	0.53
Madison, Fla.	1923						
	Oct. 1	0.0	0.0	1.8	0.28	0.7	0.46
	Oct. 15	1.3	0.41	4.2	0.64	1.6	1.05
	Nov. 1	6.6	2.08	13.5	2.06	2.9	1.91
	Nov. 15	2.7	0.85	6.6	1.01	0.4	0.26
	Dec. 1	5.2	1.65	6.6	1.01	2.0	1.32
Madison, Fla.	1924						
	Oct. 1	1.7	0.15	.....	.....	0.8	0.06
	Oct. 7	1.6	0.14	.....	.....	10.2	0.76
	Oct. 16	3.6	0.31	.....	.....	19.0	1.41
	Oct. 23	7.5	0.64	.....	.....	14.1	1.04
	Oct. 30	9.9	0.85	**	.....	12.0	0.89
	Nov. 6	5.8	0.50	.....	.....	7.5	0.56
	Nov. 13	20.0	1.71	.....	.....	11.0	0.81
	Nov. 20	33.0	2.83	.....	.....	34.2	2.53
	Nov. 27	22.0	1.88	.....	.....	12.8	0.95
Mansura, La.	1908						
	Sept. 28	2.7	0.13	.....	.....	.....	.....
	Oct. 5	1.3	0.06	.....	.....	.....	.....
	Oct. 12	5.5	0.27	.....	.....	.....	.....
	Oct. 19	1.6	0.08	.....	.....	.....	.....
	Oct. 26	25.1	1.25	.....	.....	.....	.....
	Nov. 2	23.3	1.16	.....	.....	.....	.....
	Nov. 9	24.4	1.21	.....	.....	.....	.....
	Nov. 16	26.7	1.33	.....	.....	.....	.....
	Nov. 23	12.7	0.63	.....	.....	.....	.....
	Nov. 30	29.7	1.48	.....	.....	.....	.....
	Dec. 7	23.6	1.17	.....	.....	.....	.....
	Dec. 14	47.7	2.37	.....	.....	.....	.....
	Dec. 21	37.1	1.84	.....	.....	.....	.....

*Percentage of survival of each cage divided by the mean percentage of survival of the group.

**This group of cages was partially submerged for several weeks by high water.

the percentage of survival of a cage installed before Nov. 1 equal the mean percentage of survival of its group.

The effect of installing the cages early in the fall was not nearly so pronounced in the groups placed on the ground in woods, although in all groups the highest percentages of survival were obtained from cages started as late as Nov. 1.

The relationship between the time of installing the cages and the percentage of survival was not as consistent in the groups placed in trees as in the other groups. In three out of four cases of this series rather high relative percentages of survival were secured from cages in which weevils were placed on Oct. 15 or 16, while in three out of four cases fairly low percentages of survival were secured from cages in which weevils were installed on or after Nov. 15.

The degree of linear correlation between the time of installing the cages and the percentage of survival was calculated. The data of each group were arranged exactly as in Table I, except that under column B the indexes of variation of the cages (Table III) were used. Had the actual percentages of survival been used in column B instead of the indexes of variation, the same value for the coefficient of correlation would have been obtained, except for errors of adding or dropping fractions. The numerical computation was slightly simplified, however, by the procedure employed. Table IV shows the values of the correlation coefficients so found for each group of cages.

TABLE IV.—DEGREE OF LINEAR CORRELATION BETWEEN THE DATE OF PLACING BOLL WEEVILS IN HIBERNATION CAGES AND THE PERCENTAGE OF SURVIVAL.

Location and year group was started*	Coefficient of Linear Correlation		
	Cages on ground in open field	Cages on ground in woods	Cages in trees in woods
Mansura, La., 1908	+.85	.....	.....
Madison, Fla., 1918	+.82	+.87	+.39
Madison, Fla., 1923	+.66	+.42	+.23
Gainesville, Fla., 1923	+.88	+.76	+.28
Madison, Fla., 1924	+.86	.....	+.49

*Day and month weevils were placed in each cage is shown in Table III.

It can be seen from Table IV that the correlation between the date of placing the weevils in the hibernation cages and the percentage of survival was positive for all groups of cages studied. The correlation was highest for the groups placed on the ground in fields, while the groups placed in trees in woods showed a low degree of correlation between the date of confinement and the percentage of survival.

This, however, should not be interpreted to mean that the destruction of the green cotton stalks early in the fall would prove of little benefit in localities where weevils are supposed to hibernate largely in mossy trees. Early stalk destruction greatly reduces the number that hibernate, and certainly for this reason reduces the number that emerge the following spring. Furthermore, cage hibernation tests have been shown to be decidedly unreliable as a means of predicting the time of appearance of boll weevils in the cotton fields (1) (2) (3). It would be unsafe therefore to conclude that destroying the stalks at different dates would have the same effect on the mortality of the over-wintering weevils as does confinement in cages at different dates. It is entirely probable that, if extensive field tests were made of early stalk destruction, the conclusions drawn from cage data concerning the effectiveness of this procedure would have to be modified considerably.

CONCLUSIONS

In nine groups of hibernation cages, some placed on the ground in open fields, some placed on the ground in woods, and some placed in trees in woods, the date of confining the weevils in the fall apparently did not determine to any considerable extent the date of their emergence the following spring.

In five groups of hibernation cages placed on the ground in open fields, the date of confinement markedly affected the percentage of emergence. The highest percentages of survival always came from cages in which the weevils were introduced moderately late in the fall.

In four groups of hibernation cages placed in trees in woods, the date of confinement of the weevils in the fall seemed only slightly to affect the percentage of survival.

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MEETINGS OF THE FLORIDA ENTOMOLOGICAL SOCIETY

March 27, 1931.—Professor Hubbell gave a very interesting talk on the group of cave-crickets or camel crickets, a group to which he has devoted a good many years of thorough study. He spoke of the geographical distribution of this group and gave several theories as to their evolution and migrations. An interesting feature of the lecture was the many examples drawn from other groups of animals and plants to show similarities in geographical distribution. This group seems to supply further evidence in support of the theory of an old Antarctic land mass connecting South America, Africa and Australia. The talk was well illustrated with maps, data, and specimens of various species of camel crickets.

Dy. Byers gave a brief discussion of C. H. Kennedy's paper "Evolutionary Level in Relation to Geographical, Seasonal and Diurnal Distribution of Insects" (Ecology IX, 4, 367, 1928).

L. W. ZIEGLER, Sect'y.

October 30, 1931.—Dr. Rogers gave the paper of the meeting on "The Crane Flies of Florida." He showed the relationship of our species to those of adjoining regions. Of the 130 species found in Florida, about 60% are northern forms, 12% species of southern genera, 16% endemic, 11% neotropical in origin and one is cosmopolitan.

H. E. BRATLEY, Sect'y.

The
FLORIDA ENTOMOLOGIST
Official Organ of The Florida Entomological Society, Gainesville, Florida.

Vol XV, No. 3 November, 1931

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Issued once every three months. Free to all members of the Society.

Subscription price to non-members is $1.00 per year in advance; 35 cents per copy.

PHOLUS FASCIATUS

ELLEN ROBERTSON MILLER

A little girl brought the moth to me. She had seen it on a vine growing over a porch. It must have been freshly emerged, for the velvet "map" upon its wings was still uninjured. What a beauty it was, a sphinx moth new to me. The fore wings were of a deep brown with a band of rich cream color crossing each from the apex to the middle of the inner margin, and another, equally wide, starting at the body met this, and with it formed a conspicuous Y. The hind wings in addition to the brown, showed pea-green and rose colors, while the big, tapering body was clothed in brown and cream "fur". The insect, a female, measured five inches when spread.

A couple of years later on June 9, 1926, among the water plants growing close to our bath house at Lake Wildmere, Florida, I saw a large brightly colored sphinx larva, at least five and one half inches long resting on a leafless stem. I captured it with my butterfly net and found that it was strikingly marked. The head was a mahogany red with a black clypeus and black adfrontals, the first segment had an amber shield, marked with five dark dots. There was a stripe of brown down the back with dull yellow on either side crossed by lines of brown. The yellow became a circular spot on the eleventh segment where the horn of many of the sphinx larvae is located. The caterpillar lacked this appendage. A pale blue stripe began on the second segment and ran back over the third, then, with a break, down onto the

side of the fourth, making an angle. Another blue line began on the fourth and ran down onto the fifth. There were eight of these angles on each side of the larva. The spiracles, outlined in gray, were at the lower edge of the blue stripe in trangular black areas. The skin below the spiracles had a pea-green color, marked on the ventral surface with dark. The prolegs were red with black on the upper portions, the remainder of the caterpillar's skin showed a dull old rose color.

Near this larva I found a second one but half its size, a facsimile in miniature, except that the colors were more vivid.

I gathered leaves from the aquatic plants among which the insects rested but neither would feed upon them so I replaced the smaller specimen and left it to shift for itself while I confined the other in a box with earth. It appeared to be in fine condition and on June 12 went into the ground and changed to a pupa. The pupa case had no handle or separate tongue sheath.

Fifteen days later, in the evening, the moth emerged as *Pholus fasciatus*, a male, smaller than my first specimen but with practically the same colors and markings on its wings. Then I realized that if I had known its "wormship" for what it was I could have reared the younger larva on grape leaves. But for the half grown caterpillar close to the mature specimen I should conclude that the latter had lived on a wild grape vine near the water, and that when discovered it was searching for dry land in which to pupate. The presence of the younger crawler, however, makes it seem likely that among the aquatic plants by the bath house there was one acceptable as food to the young of *Pholus fasciatus*.

SCARCITY OF THE ZEBRA BUTTERFLY

That interesting butterfly, a northern outpost of the family of Heliconians which are extremely numerous in the tropics of the New World, *Heliconius charitonius* is usually common here in north central Florida in the fall. It can be seen lazily flapping its long striped wings along almost any woods road. But this fall it has been almost entirely absent. The writer has not seen a half dozen specimens. What is the cause? Is it drought? The Gainesville section has not had a significant shower since mid September. The caterpillar feeds on the passion flower, Passiflora. We have missed this striking reminder that we live on the edge of the tropics.

TWO NEW THYSANOPTHERA FROM COLORADO

J. R. WATSON

PROSOPOTHRIPS BRUNNEUS n.sp.

Female—Length 0.76 mm., color dark brown, only antennal segments 3-5 distal, half of fore tibiae and fore tarsi lighter, yellowish brown.

Head about as wide as long, half of it retracted into prothorax; very narrow, greatest width (across eyes) but little more than half the width of prothorax (including coxae). Exposed portion twice as wide as long; reticulations weak, not extending to vertex, frons abruptly darker, almost black, straight except for two knob-like projections near the middle. These projections are much smaller than in *P. cognatus*, occupying only about half the vertex, but are sufficiently large to almost cover the first antennal segment; the notch between them not as deep as in *cognatus*. Cheeks roughened by several low, broad tubercles bearing minute bristles. Vertex bearing four rather prominent bristles. Eyes strongly protruding. Ocelli lacking. Mouth cone long, reaching three-fourths the distance across the prosternum. Antennae fully twice as long as width of head. Segment 1 hemispherical, much smaller than 2; 2 trapezoidal in shape with a broad pedicel, like 1 concolorous with the head; 3 and 4 sub-spherical and 5 short barrel shaped, all with narrow, almost colorless pedicels (3 especially narrow); progressively larger, yellowish brown, 5 darker; 6 lanceolate in outline, concolorous with the body; 7 and 8 cylindrical, very narrow. Segments 2-6 all show prominent encircling lines, four of those on segment 6 are especially prominent.

Prothorax considerably longer than wide and over three times as long as the exposed portion of the head, dorsal surface dotted with about 15 pairs of bristles. Meso- and meta-thorax narrow and very similar in appearance to abdominal segments. Posterior border of metathorax scalloped, as are those of abdominal segments 1-8. Legs, short and stout (tho not as short as in the other species), concolorous with the body except distal half of fore tibiae and fore tarsi which are yellowish brown.

Abdomen large and heavy. Segment 1 about same width as the metathorax, others widening to about the fourth segment, thence gradually narrowing. Segment 10 broad, not narrow and cylindrical as in *cognatus*. All bristles short and colorless.

Measurements: Head, length of exposed portion .046 mm., width .09 mm.; prothorax, length .16 mm., width (including coxae) .13 mm.; mesothorax, width .19 mm.; abdomen, width .23 mm.

Antennal segments	1	2	3	4	5	6	7	8	
length	17	33	26	28	30	40	9	7	
width	21	28	16	21	19	16	6	4	microns

Total length .186 mm.

Described from a single female taken by John L. Hoerner at Rocky Ford, Colorado, on June 2, 1931, on barley. Type in the author's collection.

This interesting specimen represents the third species of this

genus to be described. *P. vejdovskyi* Uzel is the type of the genus and occurs in central Europe, from Italy to Finland. *P. cognatus* Hood was described from specimens taken on wheat in Kansas where it has been studied by E. O. G. Kelly. It has since been reported from Okla., Mo., and Neb. The author has it from Ohio. This species is easily told from the others by the color, small size, and very small head. In shape the antennal segments are closer to *cognatus* than to *vejdovskyi.*

The following key will enable one to separate the three species:

a. Body color dark brown ..... *brunneus* n. sp.
a′. Most of abdomen and pterothorax yellow
  b. Abdominal segment 10 narrow subcylindrical and heavily chitinized; antennal segment 3 subglobose ..... *cognatus* Hood
  b′. Abdominal segment 10 wider conical and not heavily chitinized; antennal segment 3 oblong oval ..... *vejdovskyi* Uzel

TRICHOTHRIPS HOERNERI n. sp.

Female (macropterous). Length about 2.1 mm., (one 2.28 mm.) color blackish brown, tarsi, tips of tibiae and antennal segments 2-8 lighter brown.

Head about as wide as long, cheeks nearly straight and quite markedly converging posteriorly, somewhat roughened and bearing numerous small hairs; postocular bristles dark, sharp-pointed, reaching about to middle of eyes. Eyes large, occupying .4 the length of head. Ocelli large, anterior directed forward and slightly overhanging, posterior well in front of middle of eyes. Antennae about twice the length of head; segment 1 concolorous with the head, others quite variable in color but mostly light brown with darker brown clouds, three usually lighter, usually brownish yellow as are sometimes 4-8; 1 nearly cylindrical, slightly wider at base; 2 barrel shaped abruptly contracted to a pedicel half the greatest width of the segment; 3 elongated wedge shaped, with nearly straight sides converging to a rather narrow pedicel; 4 oval, 5-7 barrel shaped, abruptly contracted to wide pedicels; 8 conical; bristles and sense cones slender, pale and rather inconspicuous. Mouth cone reaching fully two-thirds across prosternum.

Prothorax about two-thirds as long as head, and fully twice as wide (including coxae) as long. One long curved bristle at each posterior angle about four-sevenths the length of prothorax, the other and one on each anterior angle and a pair along the anterior margin only about a third as long.

Pterothorax considerably wider than prothorax, sides slightly convex. Wings of equal width throughout, reaching about to the sixth abdominal segment, nearly colorless except a brown patch at base. Fringing hairs long, double for about 12 or 13 hairs. Legs slender; fore tarsi unarmed.

Abdomen large and heavy, slightly wider than pterothorax. Tube about three-fourths as long as the head, more than twice as wide at base as at apex, sides straight. Bristles light, short and inconspicuous, those on segment 9 about half as long as tube, terminal ones considerably shorter than the tube.

Measurements: Head, length .23 mm., width .22 mm.; prothorax, length .18, width .37 mm.; mesothorax, width .47 mm.; abdomen, width .52 mm.; tube, length .177 mm., width at base .093 mm., at apex .042 mm.

Antennae	Total length .475 mm.							
Segment	1	2	3	4	5	6	7	8
length	35	59	76	71	70	67	59	36
width	39	35	30	36	33	33	28	16 microns

Micropterous female. Smaller than the macropterous. Average length 1.8 mm. (from 1.5 to 2 mm.). At most only the brown scale of the wing present. Antennal segment 1, 35 (35); 2, 47 (30); 3, 70 (28); 4, 61 (32); 5, 61 (28); 6, 56 (28); 7, 54 (23); 8, 31 (12) microns.

Male (Macropterous).—Smaller than the female. In the single specimen the antennae and fore tibiae and tarsi much darker, nearly concolorous with the head. Tube abruptly swollen at base. Fore femora but little larger than in the female.

Measurements: Total body length 1.8 mm.; head, length .21 mm., width .20; prothorax length .15 mm., width .33; tube, length .16 mm., width at base .08 mm., at apex .035 mm.; antennae, total length .43 mm., segment 1, 28 (37); 2, 51 (30); 3, 70 (30); 4, 65 (33); 5, 67 (30); 6, 58 (30); 7, 56 (26); 8, 37 (14) microns.

Micropterous male. Smaller than the macropterous male. Antennae colored as in the females.

Measurements: Total body length 1.5 mm. and 1.6 mm. Head, length .20 mm., width .19 mm.; prothorax, length .14 mm., width (including coxae) .31 mm.; mesothorax, width .32 mm.; abdomen, width .43 mm.; tube, length .14 mm., width at base .08 mm., at apex .035 mm. Antennae segment 1, 28 (35); 2, 58 (32); 3, 66 (29); 4, 63 (32); 5, 64 (30); 6, 62 (28); 7, 55 (25); 8, 32 (14) microns. Total length .425 mm.

Larvae. Light brown in color of head, legs, and antennae, but thorax and abdomen colored bright red by hypodermal pigment except, usually, abdominal segments 9 and 10. Each segment bears near the middle of each lateral margin a prominent, stiff knobbed bristle. On abdominal segments 7 and 8 there is another somewhat mediad and on the abdominal segment 9 and the thoracic segments 2 others. Those on the 9th segment are situated on the posterior angles and are nearly as long as the 10th segment. One terminal pair are longer than the 10th segment and sharply bent inward about the middle. There are four pair of much more slender and shorter bristles. Antennae 7 segmented.

The last (?) instar is from 1.1 to 1.7 mm. in length, antennal segment 3 is elongate clavate and three times as long as wide; segment 4 over twice as long as wide. 7 cylindrical and less than twice as long as wide.

In the preceding instar (length 1. mm.) the third and fourth antennal segments are nearly as wide as long, and the seventh is sharply conical and the length three times the basal width.

Described from twelve macropterous and 5 micropterous females, one macropterous and two micropterous males and six larvae collected from Woodbine at Ft. Collins, Colo., by John Hoerner. Type in the author's collection.

In color, the unarmed tarsi, and the acute bristles, this species resembles *T. fuscicornis* Hood; but differs in the lighter antennae, the large eyes, color of wings, the larger number of interlocated bristles and the much shorter eighth antennal segment. In the color of the antennae and the minutely spinose checks, this species resembles the European *T. cortices* (Deg) but that species has a long slender tarsal spine and yellow tibiae.

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It will pay you to investigate. Ask the State Entomologists.

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WILL KILL

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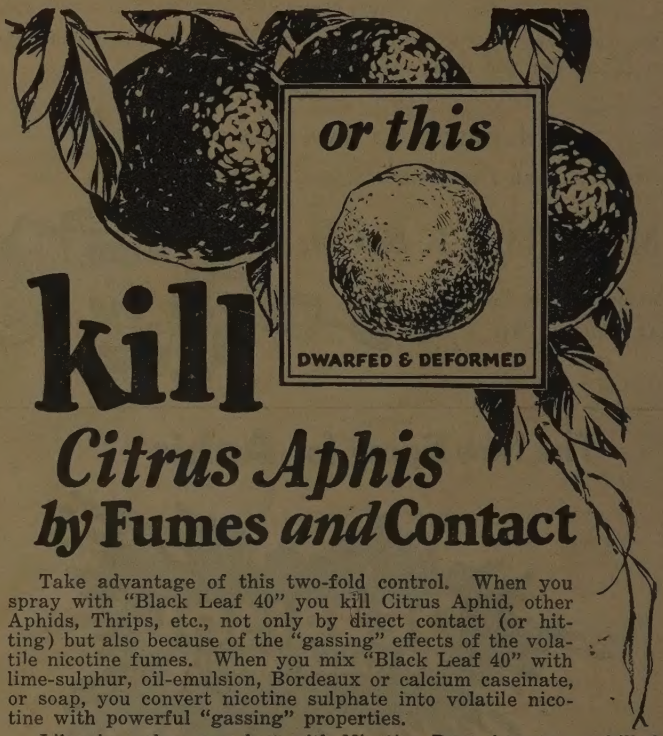

kill *Citrus Aphis* *by* Fumes *and* Contact

Take advantage of this two-fold control. When you spray with "Black Leaf 40" you kill Citrus Aphid, other Aphids, Thrips, etc., not only by direct contact (or hitting) but also because of the "gassing" effects of the volatile nicotine fumes. When you mix "Black Leaf 40" with lime-sulphur, oil-emulsion, Bordeaux or calcium caseinate, or soap, you convert nicotine sulphate into volatile nicotine with powerful "gassing" properties.

Likewise, when you dust with Nicotine Dust, insects are killed by actual contact of the dust with their bodies and also by the powerful nicotine gas.

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40% Nicotine